

**Revision of the Total Maximum Daily Load for Nitrogen  
Compounds and Related Effects in the Los Angeles  
River**

**Draft  
Staff Report**

August 31, 2012

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# 1. Introduction

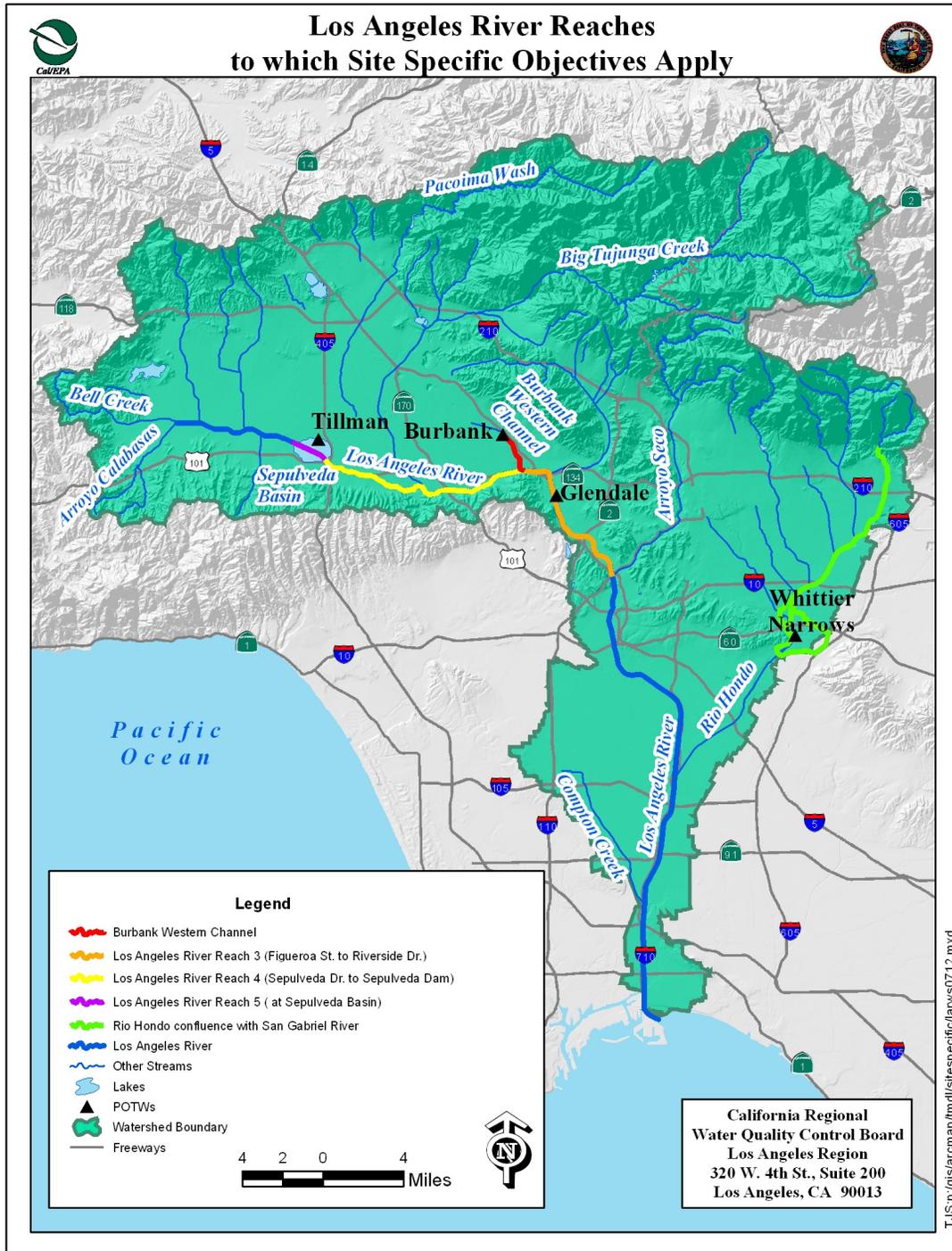
This staff report discusses the scientific and regulatory basis for a proposed Basin Plan Amendment to revise the Los Angeles River Nitrogen Compounds and Related Effects Total Maximum Daily Load (TMDL). The proposed revision modifies numeric targets to reflect site-specific objectives (SSOs) for ammonia for the Los Angeles River Reaches 3-5, Rio Hondo Reach 3, and the Burbank Western Channel (Figure 1) and waste load allocations (WLAs) for the four publicly owned treatment works (POTWs) that discharge to these reaches. The SSOs upon which the TMDL revision is based were previously adopted as a Basin Plan Amendment by the Los Angeles Regional Board and approved by the State Water Resources Control Board, the Office of Administrative Law (OAL), and U.S. EPA. The proposed revision to the TMDL conforms the TMDL's numeric targets and waste load allocations to the currently effective water quality objectives for ammonia.

## ***1.1 History of the TMDL and Ammonia Water Quality Objectives***

The Los Angeles Regional Board adopted the Los Angeles River Nitrogen Compounds and Related Effects TMDL on July 10, 2003 under Resolution No. 2003-009. The TMDL was subsequently approved by State Board, OAL, and U.S. EPA on November 19, 2003, February 27, 2004, and March 18, 2004, respectively. The TMDL's numeric targets and waste load allocations for ammonia were based on U.S. EPA's 1999 Update of Ambient Water Quality Criteria for Ammonia. The effective date of the TMDL was March 23, 2004, when the Certificate of Fee Exemption was filed with the California Department of Fish and Game. The TMDL required POTWs to attain final ammonia WLAs by September 23, 2007. The TMDL included implementation tasks for the City of Los Angeles to evaluate site specific objectives for ammonia, nitrate, and nitrite and for the Regional Board to consider a revision of waste load allocations based on the study.

At the same time the TMDL was undergoing the approval process, a Basin Plan amendment to revise ammonia water quality objectives to be consistent with U.S. EPA's 1999 Update of Ambient Water Quality Criteria for Ammonia was undergoing the approval process. The update of freshwater ammonia water quality objectives became effective on July 15, 2003. Both the U.S. EPA 1999 update and the Basin Plan amendment incorporating the update allow for the development of water effects ratios (WERs) to account for site-specific conditions that affect ammonia toxicity. A WER is the ratio of the toxicity of a chemical in site water to that chemical's toxicity in laboratory test water. In the absence of a site-specific study, a WER is assumed equal to 1.0.

Figure 1.



The Regional Board revised the TMDL on December 4, 2003 by Resolution No. 2003-016. This resolution altered the interim ammonia WLAs to coincide with timing of construction of nitrification and denitrification facilities to treat effluent from the major POTWs that discharge into the Los Angeles River. The resolution was limited to the issue of interim ammonia WLAs and the TMDL remained unchanged in all other respects. The re-adopted TMDL was subsequently approved by State Board and OAL (U.S. EPA approval is not required for a change to the implementation plan) with an effective date of September 27, 2004.

Application of the 30-day average objectives recommended by the U.S. EPA in its 1999 Update of Ambient Water Quality Criteria for Ammonia is based on the presence or absence of early life stages (ELS) of fish in waterbodies. The Los Angeles Regional Board's 2003 update of freshwater ammonia objectives relied on the region's "Spawning, Reproduction and/or Early Development" (SPWN) beneficial use as a proxy for the presence of ELS. On December 1, 2005, the Regional Board revised the implementation provisions for ammonia water quality objectives to classify ELS status in waterbodies within the region as present or absent. The 2005 amendment included a table that defined specific reaches as ELS absent. All reaches not included in this table are presumed to be ELS present year round unless a site-specific study is conducted that justifies applying the ELS absent condition or a seasonal ELS present condition.

The current proposal incorporates SSOs and updated ELS implementation provisions for ammonia into the Los Angeles River Nitrogen Compounds and Related Effects TMDL. The SSOs are based on the results of a WER study completed by the City of Los Angeles, County Sanitation Districts of Los Angeles County, and the City of Burbank. These SSOs, in addition to ammonia SSOs for the San Gabriel and Santa Clara River watersheds, were previously incorporated into the Basin Plan by resolution 2007-005, adopted by the Regional Board on June 7, 2007.

According to the implementation tasks in the Los Angeles River Nitrogen Compounds and Related Effects TMDL and U.S. EPA regulations for establishing effluent limitations in National Pollution Discharge Elimination System (NPDES) permits (40 CFR §122.44 (d)(vii)(B)), in order for the ammonia SSOs to be incorporated into the NPDES permits for the POTWs in the Los Angeles River watershed, the Los Angeles River Nitrogen Compounds and Related Effects TMDL must be revised to reflect the SSOs.

### 1.1.1 Summary of TMDL and Ammonia Water Quality Objective History

Table 1. Historical Timeline

Effective Date	Event	Resolution #
1999	1999 Update of Ambient Water Quality Criteria for Ammonia (U.S. EPA)	N/A
15-Jul-2003	Update of Freshwater Ammonia Objectives	R02-011
23-Mar-2004	Los Angeles River Nitrogen Compounds and Related Effects TMDL	R03-009
27-Sep-2004	Los Angeles River Nitrogen Compounds and Related Effects TMDL (Revision of Interim WLAs)	R03-016
5-Apr-2007	Revision of Early Life Stage Provision of Freshwater Ammonia Objectives	R05-014
23-Apr-2009	SSOs for Ammonia in the San Gabriel, Los Angeles, and Santa Clara River Watersheds	R07-005

## 1.2 TMDL Requirements

The technical basis for the TMDL adopted by Resolution No. R03-009 is contained in the July 10, 2003 staff report entitled “Total Maximum Daily Loads for Nitrogen Compounds and Related Effects – Los Angeles River and Tributaries.”

### 1.2.1 TMDL Numeric Targets

The TMDL specifies numeric targets for ammonia-nitrogen (NH<sub>3</sub>-N), nitrate-nitrogen (NO<sub>3</sub>-N), nitrite-nitrogen (NO<sub>2</sub>-N), and nitrate-nitrogen plus nitrite-nitrogen (NO<sub>3</sub>-N + NO<sub>2</sub>-N). The proposed TMDL revisions pertain only to ammonia; therefore, the remainder of this report will focus solely on ammonia.

The ammonia targets are based on the criteria developed by the U.S. EPA in the 1999 Update of Ambient Water Quality Criteria for Ammonia. The U.S. EPA criteria document recommends the use of temperature and pH dependent formulas for determining ammonia criteria. Four formulas are presented, creating different criteria for chronic (thirty-day) and acute (one-hour) exposure and depending on whether or not ELS fish are present. The TMDL applies these

formulas to the Los Angeles River using three years of temperature and pH receiving water data to prescribe numeric targets for specific reaches (Table 2).

**Table 2. Los Angeles River numeric targets for ammonia as nitrogen (NH<sub>3</sub>-N)**

<b>Los Angeles River Reach</b>	<b>One-hour average (mg/L)</b>	<b>Thirty-day average (mg/L)</b>
Reach 3 (Riverside Dr. to Figueroa St.) – Los Angeles/Glendale WRP	8.7	2.4
Reach 5 (within Sepulveda Basin) – Donald C. Tillman WRP	4.7	1.6
Burbank Western Channel – Burbank WRP	10.1	2.3

### 1.2.2 TMDL Allocations

WLAs for ammonia (NH<sub>3</sub>) include one-hour and thirty-day averages and are based on the pH and temperature data downstream from the POTWs. The Donald C. Tillman (Tillman), Los Angeles-Glendale (LA-Glendale), and Burbank water reclamation plants are the three largest POTWs in the Los Angeles River watershed. The final ammonia WLAs for these POTWs are shown in Table 3.

**Table 3. Ammonia WLAs for major POTWs in Los Angeles River watershed**

<b>POTW</b>	<b>One-hour average WLA (mg/L)</b>	<b>Thirty-day average WLA (mg/L)</b>
Donald C. Tillman WRP	4.2	1.4
Los Angeles-Glendale WRP	7.8	2.2
Burbank WRP	9.1	2.1

Ammonia WLAs for minor point sources, including the Whittier Narrows WRP, are set at levels necessary to maintain the applicable water quality objective and are established in accordance to the reach into which a minor point source discharges based on instream pH and temperature. Ammonia WLAs for minor point source discharges are listed in Table 4.

**Table 4. Ammonia WLAs for minor point sources in Los Angeles watershed**

<b>Water body</b>	<b>One-hour average WLA (mg/L)</b>	<b>Thirty-day average WLA (mg/L)</b>
Los Angeles River Reach 3 above Los Angeles-Glendale WRP and Reaches 4-6	4.7	1.6
Los Angeles River Reach 3 below Los Angeles-Glendale WRP and Reaches 1 and 2	8.7	2.4
Los Angeles River Tributaries	10.1	2.3

## **2. Background on Ammonia SSO Adoption**

The TMDL specified implementation tasks to allow for the adjustment of ammonia waste load allocations through the use of SSOs. Temperature, pH, and hardness are some of the chemical conditions that can affect the toxicity of ammonia to aquatic life. One of the means for generating site-specific objectives is to base the objectives on a WER designed to account for the site-specific chemical conditions of a water body.

On June 7, 2007 the Los Angeles Regional Board adopted Resolution R07-005, a Basin Plan Amendment that incorporated site-specific objectives for ammonia into the Basin Plan. Resolution R07-005 applies to the San Gabriel, Los Angeles, and Santa Clara River Watersheds and went into effect on April 23, 2009. Resolution R07-005 incorporated SSOs for select inland surface waters based on a 2003 WER study funded by the City of Los Angeles, the County Sanitation Districts of Los Angeles County and the City of Burbank. The amendment changed the previous 30-day average (i.e. chronic) objective in Chapter 3 of the Basin Plan for a subset of inland surface waters. The amendment did not change the one-hour average (i.e. acute) objective. Additionally, the amendment added site-specific implementation provisions for protection of ELS.

### **2.1 2003 Ammonia WER Study**

In September 2003 the final technical report titled *Ammonia Water Effects Ratios and Site-Specific Objectives for Los Angeles County Waterbodies-Final Results* was prepared by Larry Walker Associates under contract to the County Sanitation Districts of Los Angeles County, City of Los Angeles, and City of Burbank. The focus of the study was on the water downstream of ten POTW discharges. A public participation plan was included in the ammonia WER study. As part of the plan, a technical advisory committee (TAC) and a coordinating committee reviewed the work plan, work progress, and the final study report.

The TAC included experts not affiliated with the project and the coordinating committee included Regional Board staff, other state and federal agency staff and other interested parties. Additionally, a stakeholder coordinating committee comprised of representatives of organizations that would be affected by, or had general interest in, the study and its outcome, met several times during the course of the study.

As the proposed basin plan amendment is specific to the Los Angeles River, the remainder of this report will focus on the portions of the WER study specific to the Los Angeles River watershed. Four locations in the Los Angeles River were investigated in the WER study. These sites are downstream of the Tillman, LA-Glendale, Burbank, and Whittier Narrows POTWs.

The ammonia objectives are equations which integrate invertebrate and fish toxicity. Toxicity tests from two organisms were employed in the WER study: *Hyallolela azteca* was used to investigate invertebrate toxicity and *Pimephales promelas* (fathead minnow) was used to study toxicity to fish. Initial investigations showed the WER for *P. promelas* to be sufficiently close to 1.0 that the technical advisory committee recommended developing a WER for *H. azteca* and adjusting only the invertebrate data applied in the ammonia objective calculation; whereas the fish data used to calculate the ammonia objective would not be adjusted. As part of the calculation process, the lower of either the adjusted *H. azteca* GMCV (genus mean chronic value) or the lowest fish GMCV is selected. This incorporation of the lower value results in a SSO that is protective of both invertebrate and fish species.

The WER values were calculated based on the procedures presented in the *Interim Guidance on the Development of WERs for Metals* (USEPA, 1994). Field samples were collected from January 2002 to February 2003. The final WERs (fWERs) calculated in the 2003 WER study are presented in Table 5.

**Table 5. Final WERS (fWERs) by reach**

Reach	Final WER
Los Angeles River Reaches 4 and 5	1.966
Los Angeles River Reach 3	1.967
Burbank Western Channel	1.400
Rio Hondo Reach 3	2.094

WERs are generally applied by multiplying the original objective by the WER. The TAC chose an alternative approach to ensure protection of both invertebrate and fish species. The recommended SSO is a result of fWERs for *H. azteca* being directly incorporated into equations from EPA's 1999 Update of Ambient Water Quality Criteria for Ammonia.

## ***2.2 Site-specific Implementation Provisions for Protection of ELS***

In addition to incorporating ammonia SSOs based on the 2003 WER study, Resolution R07-005 added site-specific implementation provisions for the protection of ELS. Where the 2005 Basin Plan amendment had defined specific reaches as ELS absent, the 2007 amendment updated the ELS status of reaches of the Los Angeles River and defined seasonal periods of ELS presence and absence in these reaches. The resulting final SSO equations for ELS present/absent periods are presented in Table 6.

**Table 6. Site-Specific 30-day Average Objectives for Ammonia by Site**

<b>Los Angeles River, Reach 5 (Sepulveda Basin)</b>	<b>ELS Present (from April 1 – September 30)</b>	$CCC = \left( \frac{0.0676}{1 + 10^{7.688 - pH}} + \frac{2.912}{1 + 10^{pH - 7.688}} \right) * 0.854 * \text{MIN}(2.85, 2.85 * 10^{0.028 * (25 - T)})$
	<b>ELS Absent (from October 1 – March 31)</b>	$CCC = \left( \frac{0.0676}{1 + 10^{7.688 - pH}} + \frac{2.912}{1 + 10^{pH - 7.688}} \right) * 0.854 * 2.85 * 10^{0.028 * (25 - \text{Max}(T, 7))}$
<b>Los Angeles River, Reach 4 (Sepulveda Dam to Riverside Drive)</b>	<b>ELS Absent (year round)</b>	$CCC = \left( \frac{0.0676}{1 + 10^{7.688 - pH}} + \frac{2.912}{1 + 10^{pH - 7.688}} \right) * 0.854 * 2.85 * 10^{0.028 * (25 - \text{Max}(T, 7))}$
	<b>ELS Present (from April 1 – September 30)</b>	$CCC = \left( \frac{0.0676}{1 + 10^{7.688 - pH}} + \frac{2.912}{1 + 10^{pH - 7.688}} \right) * 0.854 * \text{MIN}(2.85, 2.85 * 10^{0.028 * (25 - T)})$
<b>Los Angeles River, Reach 3 (Riverside Drive to Figueroa Street)</b>	<b>ELS Absent (from October 1 – March 31)</b>	$CCC = \left( \frac{0.0676}{1 + 10^{7.688 - pH}} + \frac{2.912}{1 + 10^{pH - 7.688}} \right) * 0.854 * 2.85 * 10^{0.028 * (25 - \text{Max}(T, 7))}$
	<b>ELS Absent (year round)</b>	$CCC = \left( \frac{0.0676}{1 + 10^{7.688 - pH}} + \frac{2.912}{1 + 10^{pH - 7.688}} \right) * 0.92 * 2.03 * 10^{0.028 * (25 - \text{Max}(T, 7))}$
<b>Burbank Western Wash (Burbank Water Reclamation Plant to confluence with LA River)</b>	<b>ELS Present (from April 1 – September 30)</b>	$CCC = \left( \frac{0.0676}{1 + 10^{7.688 - pH}} + \frac{2.912}{1 + 10^{pH - 7.688}} \right) * 0.854 * \text{MIN}(2.85, 3.04 * 10^{0.028 * (25 - T)})$
	<b>ELS Absent (from October 1 – March 31)</b>	$CCC = \left( \frac{0.0676}{1 + 10^{7.688 - pH}} + \frac{2.912}{1 + 10^{pH - 7.688}} \right) * 0.854 * 3.04 * 10^{0.028 * (25 - \text{Max}(T, 7))}$

In addition, the highest four-day average within the 30-day period shall not exceed 2.5 times the 30-day average objective shown in Table 6.

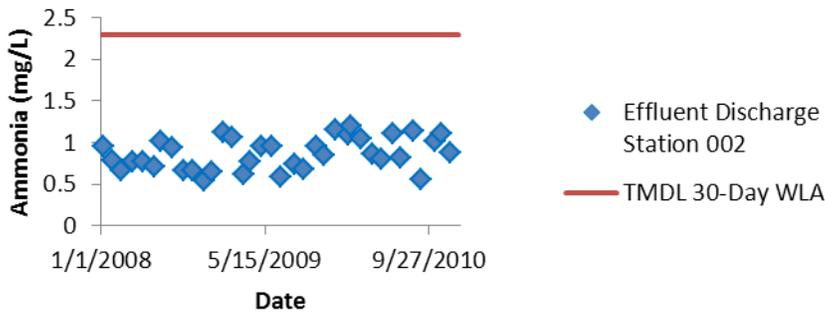
### 3. Rationale for Revisions to TMDL

The current TMDL implementation schedule and permit provisions required that the Tillman, LA-Glendale Burbank, and Whittier Narrows POTWs achieve compliance with NPDES permit limits for ammonia based on the existing final

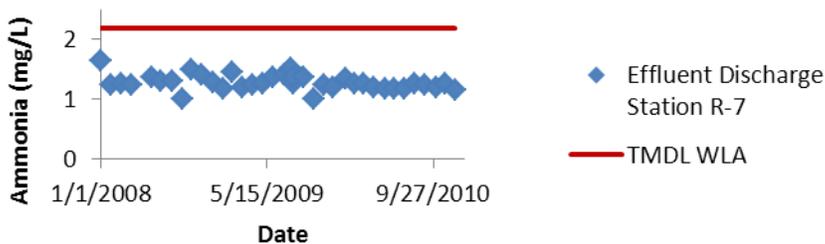
ammonia WLAs by September 23, 2007. The SSOs adopted by the 2007 Basin Plan amendment are based on the 2003 WER study, which demonstrates that the POTWs can discharge ammonia at levels higher than the existing WLA-based permit limits and still fully protect beneficial uses. The Cities of Los Angeles and Burbank have requested that the Regional Board adjust permit limits to reflect the findings of the 2003 WER study. However, as will be discussed later, regardless of the WER, POTW effluent limitations must ensure that effluent concentrations do not exceed the level of water quality that can be reliably maintained by the facility's applicable treatment technologies.

The Burbank, Glendale, and Whittier Narrows WRPs are currently meeting their existing WLA-based ammonia permit limits, but the Tillman WRP occasionally exceeds its limit (Figures 2-5). A TSO, time schedule order, set at 2.2 mg/L (a value below the SSO and greater than the TMDL WLA), is in effect for the Tillman WRP until September 30, 2012. Another TSO may be issued after September 30, 2012, if the Los Angeles River Nitrogen Compounds TMDL has not been revised to incorporate the ammonia SSO. The adoption of this basin plan amendment will eventually alleviate the necessity for the TSO.

**Figure 2. Ammonia: Burbank WRP**



**Figure 3. Ammonia: Los Angeles - Glendale WRP**





Related Effects TMDL to adjust the numeric targets for Los Angeles River Reaches 3-5, Rio Hondo Reach 3, and the Burbank Western Channel as well as the WLAs for the POTWs in the corresponding reaches. As discussed earlier, the SSOs apply solely to the areas of the river directly downstream of the POTWs; therefore, it is not appropriate to adjust the numeric targets, LAs or WLAs for areas upstream of POTWs or other reaches without further research. The ammonia allocations for sources that discharge upstream of POTWs or to other reaches remain based on the default WER value of 1.0. If the Regional Board reconsiders the SSOs based on additional monitoring that indicates toxicity or a change in characteristics of the waterbody, the Regional Board will revise the TMDL to be consistent with the revised SSOs.

In addition to the updates discussed throughout this report, staff recommends making a correction to the original numeric targets included in this TMDL. The one-hour ammonia numeric target for Reach 5 (Table 2) was based on data from monitoring site R7, located 1800 feet downstream from Discharge 008 in Reach 4. The Donald C. Tillman WRP discharges to both Reaches 4 and 5. Given that the data are from Reach 4, the numeric target should apply to this reach and the TMDL should be corrected to assign the numeric targets listed for Reach 5 appropriately to both Reaches 4 and 5. The TMDL assigns identical WLAs to both reaches; therefore, this change will not result in any adjustment of WLAs.

#### ***4.1 Revised Numeric Targets and WLAs***

Based on the 2007 ammonia SSOs, the TMDL's thirty-day average numeric targets for Los Angeles River Reaches 3-5, Rio Hondo Reach 3, and the Burbank Western Channel will be changed from the numbers currently presented in the TMDL to the equations in Table 6 of this report. In addition, the WLAs for the Burbank, Tillman, Los Angeles-Glendale, and Whittier Narrows POTWs will be revised based on the equations in Table 6 as well. Language will be included specifying that permit writers shall translate WLAs into effluent limits using the past three years of pH and temperature monitoring data. The medians of pH and temperature data shall be used to establish the thirty-day average numeric targets and WLAs.

The TMDL includes a margin of safety of 10% in assigning WLAs to major point sources. The same 10% margin of safety will still be applied to the SSOs. Minor point sources, including the Whittier Narrows WRP, are not subject to this margin of safety in the TMDL.

The effluent limitations for the Tillman, Burbank, and LA-Glendale POTWs shall ensure that effluent concentrations do not exceed the level of water quality that can be reliably maintained by the facility's applicable treatment technologies existing at the time of permit issuance, reissuance, or modification. Regional Water Board staff is in the process of convening a workgroup to evaluate alternative methodologies for calculating effluent limitations for discharges with

concentrations below site-specific water quality objectives, such as is the case here, in order to ensure compliance with anti-degradation and anti-backsliding requirements.

#### **4.2 Proposed Changes to Implementation and Monitoring**

Staff proposes that the ammonia SSOs in Table 6 for Reaches 3-5 of the Los Angeles River, Rio Hondo Reach 3, and the Burbank Western Channel shall continue to apply to the TMDL unless the SSOs are reconsidered.

Staff recommends that the formulaic SSOs (Table 6) be used to calculate numeric WLAs for inclusion in permits. The application of formulas directly to WLAs allows for periodic adjustments resulting from changes in pH and temperature, both of which affect ammonia toxicity. Translation of formulaic WLAs to numeric limits in the permits removes ambiguity during permit implementation. Three years of historical data shall be used to translate each targeted WLA into a permit limit. The selection of a three-year historic time period is consistent with the calculation of numeric targets in the original TMDL.

The Tillman, LA-Glendale, Burbank, and Whittier Narrows POTWs must conduct additional receiving water monitoring to verify that water quality conditions are similar to those of the 2003 ammonia SSO study period. Monitoring is also required to determine if the SSO-based ammonia WLAs will achieve downstream water quality standards. This additional confirmatory monitoring shall be required through the POTWs' NPDES permit monitoring and reporting programs or other Regional Board required monitoring programs.

Confirmatory monitoring will be supplemental to three species toxicity testing required in the NPDES permits and must utilize *Hyallela azteca* as the test organism. If any confirmatory monitoring suggests toxicity, then side-by-side toxicity testing of *Hyallela azteca* in site water and laboratory water is required. Temperature, pH, and ammonia receiving water data will be collected at the time and location of collection of the toxicity samples. Monitoring of chemistry and toxicity testing should include a minimum of three sample events per year for three years<sup>1</sup>. Monitoring sites should be representative of those investigated in the Los Angeles River during the WER study, as well as one location in the reach immediately downstream of where the WER is applied. Two of the three sample events should be conducted during the defined critical condition, as identified by study results. Following the first three-year monitoring cycle, if there is no increase in toxicity attributable to ammonia, monitoring may be reduced to once every three years at each site, as appropriate. The number and type of events during the year should be as described above.

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<sup>1</sup> Chemistry monitoring to include all nitrogen species, including total ammonia, pH, hardness, temperature, sodium, potassium, calcium, BOD, sulfate, total dissolved solids, and chloride.

## **5. Antidegradation and Antibacksliding Compliance**

Section 402(o)(2) of the Clean Water Act provides statutory exceptions to the general prohibition of backsliding contained in CWA section 402(o)(1). One of these exception allows backsliding if “information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of a less stringent effluent limitation at the time of permit issuance” (Section (B)(i)). The WER based SSOs provide new information and therefore the POTWs may meet the backsliding exception under CWA section 402(o)(2). If a POTW can demonstrate this exception, it must then comply with State and federal anti-degradation requirements.

## **6. Conclusions and Recommendations**

The information and data summarized in this staff report support the recommended Basin Plan amendment to revise the Los Angeles River Nitrogen TMDL to comport with recently adopted SSOs for ammonia. However, notwithstanding staff recommendations, regulatory actions to achieve the revised TMDL must ensure that downstream standards will also be achieved. Due to the important existing beneficial uses of these waterbodies and the downstream coastal ecosystems to which they follow, continued monitoring is essential. The Regional Board should consider (1) amending the monitoring and reporting programs of the NPDES permittees and other dischargers subject to the SSOs to ensure that adequate data are collected to ensure that beneficial uses are fully protected and downstream standards are achieved and (2) working with dischargers and other stakeholders to encourage additional scientific research on the affected waterbodies. If the Regional Board should reconsider the SSOs based on additional monitoring that indicates toxicity or a change in the waterbody, including either its chemical characteristics or the aquatic species present, the Regional Board should revise this TMDL as well.

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